
Manipulation of an innate escape response in *Drosophila*: photoexcitation of acj6 neurons induces the escape response.

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Public Summary:

Scientific Abstract:

BACKGROUND: The genetic analysis of behavior in *Drosophila melanogaster* has linked genes controlling neuronal connectivity and physiology to specific neuronal circuits underlying a variety of innate behaviors. We investigated the circuitry underlying the adult startle response, using photoexcitation of neurons that produce the abnormal chemosensory jump 6 (acj6) transcription factor. This transcription factor has previously been shown to play a role in neuronal pathfinding and neurotransmitter modality, but the role of acj6 neurons in the adult startle response was largely unknown. **PRINCIPAL FINDINGS:** We show that the activity of these neurons is necessary for a wild-type startle response and that excitation is sufficient to generate a synthetic escape response. Further, we show that this synthetic response is still sensitive to the dose of acj6 suggesting that that acj6 mutation alters neuronal activity as well as connectivity and neurotransmitter production. **RESULTS/SIGNIFICANCE:** These results extend the understanding of the role of acj6 and of the adult startle response in general. They also demonstrate the usefulness of activity-dependent characterization of neuronal circuits underlying innate behaviors in *Drosophila*, and the utility of integrating genetic analysis into modern circuit analysis techniques.

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